

REMARKS

Favorable reconsideration of all pending claims are respectfully requested for the reasons indicated in detail below. These claims are believed to define patentable subject matter.

Claims 1-3, 5-7, 8, and 10-12 stand rejected under 35 U.S.C. 102(b) as being anticipated by Sechrist et al. (US 6,117,809).

By way of review, the present invention is a process for the production of high purity hydrogen containing essentially no carbon monoxide from a catalytic reformer. The catalytic reformer has a first catalytic zone in a lead position followed by a second catalytic zone in a lag position. In accordance with the present invention, the inlet temperature of the second catalytic zone is reduced and the inlet temperature of the first catalytic zone is increased to restore the original predetermined conversion or product octane and to thereby significantly reduce the concentration of carbon monoxide in the net hydrogen product stream.

In order to clarify the Examiner's understanding of the '809 reference, a careful reading of the reference will show that regenerated and oxidized catalyst is transported via line 16 and introduced into the top of the reduction zone catalyst bed 32. The catalyst particles flow downwardly through the reduction zone 30 in a moving packed bed 32. A reduction gas enters reduction zone 30 through line 34, passes through the catalyst bed 32 and exits through line 33. After the catalyst is reduced in catalyst bed 32, it gravitationally passes downward into reforming reactors 35, 40 and 45. A heated hydrocarbon feedstock and hydrogen are introduced into reforming reactor 35 to contact the catalyst contained therein and removed from reactor 35. The process stream which is removed from reforming reactor 35 is heated and introduced into reforming reactor 40 to contact catalyst and is then removed from reforming reactor 40. The removed process stream from reforming reactor 40 is reheated and introduced into reforming reactor 45 and contacted with catalyst and subsequently removed therefrom. The reheating between stages of the reforming reactors is necessary because the reforming of hydrocarbons is endothermic and the temperature must be maintained in each of the reforming reactors in order to achieve the desired results. The resulting spent reforming catalyst is removed from reforming reactor 45 and introduced into catalyst bed 42. The spent catalyst in catalyst zone 42 is contacted with a hydrogen

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gas containing chloride compounds to absorb at least a portion of the chloride compounds onto the spent catalyst. Catalyst bed 42 serves only as a sorption zone and is not contacted with the hydrocarbon feedstock. In summary, the '809 reference has three catalytic reformers, namely 35, 40 and 45.. Upstream of the three catalytic reformers is a reduction zone and downstream of the three catalytic reformers is a sorption zone. The hydrocarbon feedstock to the process in the '809 reference is sequentially contacted with reforming zones 35, 40 and 45. The reduction zone 30 and the sorption zone 44 contain catalyst which is only contacted with a hydrogen-rich gaseous stream and not the fresh hydrocarbon feedstock. Although the reference teaches that the reforming zones are maintained at a temperature of 454° – 538°C, the reference fails to teach that the inlet temperature of a lag catalytic reforming zone is reduced and the inlet temperature of the lead reforming catalyst zone is increased to restore the original predetermined conversion or product octane to thereby significantly reduce the concentration of carbon monoxide in the net hydrogen product stream.

Therefore, based upon the hereinabove discussion, the applicants assert that the '809 reference fails to anticipate the process of the present invention.

Claims 4, 9 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Sechrist et al. (US 6,117,809).

The Examiner states that the '809 reference fails to teach a liquid hour space velocity from about 0.5 to 4 hr⁻¹. The Examiner then goes on to state that the reference teaches that the flow rates of the reduction outlet gas streams are adjusted for the purpose of acquiring the desired temperature. The liquid hourly space velocity is a specification for the hydrocarbon feedstock passing through a catalytic reforming zone. Since the catalyst reduction zone and the catalyst sorption zone are not considered to be catalytic reforming zones, the flow rate of the gas through the reduction zone is irrelevant when considering the liquid hour space velocity through one of the catalytic reforming zones. Therefore, based upon the hereinabove discussion, the applicants respectfully submit that claims 4, 9 and 13 are not obvious in view of the '809 reference.

Claims 4, 9 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Sechrist et al. (US 6,117,809) in view of Anumakonda et al. (US 6,221,280).

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The Examiner states that the '809 reference fails to teach a liquid hourly space velocity from about 0.5 to about 4 hr⁻¹. The '280 reference discloses a method of processing hydrocarbon fuels in the absence of steam through a catalytic partial oxidation process. The feed containing only the vaporized hydrocarbon fuel and oxygen is subsequently routed through a reactor containing catalyst. The feed is partially oxidized by the catalytic reaction occurring at a temperature of no less than 1050°C (1922°F). Because of the marked difference between the '280 reference and the catalytic reforming process of the present invention, the applicants submit that an artisan would have no incentive to utilize the '280 patent to modify the '809 reference in order to arrive at the process of the present invention.

The fact that individual components can be found in prior art and rearranged to provide the benefits of the reforming process of the present invention is not a proper basis for an obviousness rejection. There must be something more in the art to suggest the modification of the cited references in obtaining the benefit that the applicants have discovered. One of ordinary skill in the art would not know the advantages which had been discovered by the applicants and described in the specification of the present application. The mere application of broad principles or goals is insufficient to provide the missing motivation or suggestion to the *prima facie* case. The use of scientific principle alone has been specifically rejected as sufficient to support a *prima facie* case of obviousness where the prior art does not suggest the desirability of the modification. Moreover, widely known and simple components when integrated into a beneficial invention are not obvious despite the use with which the two components may have been integrated if one skilled in the art recognized the benefit of the integrations.

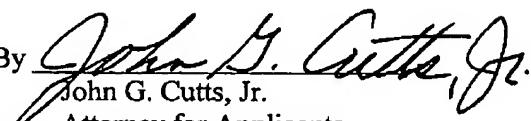
Based upon the hereinabove discussion, the applicants respectfully submit that the rejection of the pending claims under 35 U.S.C. 103 is not supported by a *prima facie* case of obviousness and should be withdrawn in view of the degree of disassembly and altered reconstruction of the prior art required to construct the applicants' invention. The applicants respectfully submit that the Examiner has cited no prior art references, either alone or in combination which disclose, teach or suggest the integrated essential features of the present invention.

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In view of the hereinabove discussion, it is respectfully submitted that all of the pending claims are allowable over 35 U.S.C. 102 and 35 U.S.C. 103 and that the application is in condition for allowance. Favorable reconsideration and allowance of the pending claims are therefore courteously solicited.

Respectfully submitted,
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